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USING COMPLEX SUPPLY THEORY TO CREATE SUSTAINABLE PUBLIC-PRIVATE PARTNERSHIPS FOR SERVICE DELIVERY: THE CASE OF SESAME WORKSHOP

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ABSTRACT

This paper analyzes the potential uses of complex supply theory to create more financially and institutionally sustainable partnerships in support of public-sector and nonprofit service deliveries. It considers current work in the field of operations theory on optimizing supply chain efficiency by conceptualizing such chains as complex adaptive systems, and offers a theoretical framework that transposes these ideas to the public sector. This framework is then applied to two case studies of financially and organizationally sustainable projects run by the nonprofit Sesame Workshop. This research is intended to contribute to the body of literature on the science of delivery by introducing the possibility of a new set of tools from the private sector that can aid practitioners in delivering services for as long as a project requires.

Keywords *- Complex Adaptive Systems, Partnership Management, Public-Private Partnerships, Science of Delivery, Sustainability*

INTRODUCTION

Financial and organizational sustainability is a major issue for development projects across sectors. Regardless of the quality or impact of an initiative, the heavy reliance of most programs on donor funding means that their existence is contingent on a variety of external factors – not least of which is the whims and desires of those providing financial support.

The rise of the nascent "science of delivery" provides us with an opportunity to critically examine how such projects, once proven effective, can be sustainably implemented and supported over a long enough period to create permanent change. From this, two key questions arise: how can practitioners create donor coalitions committed to long-term involvement, and what are the guiding principles that allow us to understand coalition behavior?

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The answer may lie within the private sector. Within the field of operations management, for example, substantial research has been done on maximizing the efficiency and longevity of supply or value networks, with a particular focus on sustained delivery through better supplier performance. In particular, one growing area over the last decade has focused on understanding supply chains as complex adaptive systems – organizations, comprised of independent agents, which behave in specific ways and can therefore be optimized by individual participants. But despite the fact that development projects, like traditional manufacturers, offer a clear product to a beneficiary-consumer, very little of this research has been applied to nonprofit service delivery.

Nonetheless, the transference of this theoretical framework offers an entirely new way to understand the "science of delivery." This paper makes the argument that **public-sector service delivery projects, like their for-profit counterparts, should be understood as not just supply chains, but complex supply networks.** The government agencies and donor coalitions that support the implementation of such projects provide inputs and receive outputs in return, and, in that sense, their behavior is predictable – and can be optimized for financial and institutional sustainability.

Paper Structure

The first part of the paper focuses on the development of a theoretical framework in support of this idea, using Veblen's concept of intangible value conversion and research from the field of corporate social responsibility to argue for the viability of the supply-chain approach and Choi et al.'s work on complexity and supply chains to support the idea that such chains may take the form of a network. The second uses this framework to analyze two case studies of financially and organizationally sustainable development projects run by the nonprofit organization Sesame Workshop, one in India and one in South Africa. The paper concludes by looking at the future applications of this theory and identifying key research areas.

LITERATURE REVIEW

The question of how to create a "sustainable" development initiative that accounts for the needs of all stakeholders has been addressed in various subsets of the international development literature. But a review of this research shows three major gaps: inconsistent definitions of the word "sustainability," contradictory recommendations for achieving sustainability, and a lack of theoretical backbone that would allow for scalability and replication.

It should be noted that one major exception exists to the following analysis, Unwin's *Partnerships in Development Practice: Evidence from multi-stakeholder ICT4D partnership practice in Africa.* Unwin's paper is addressed at the end of this section, and forms the basis of the argument that follows.

Issue #1: Defining Sustainability

At its most basic, the term "sustainable" refers to any system or process that is able to be maintained at a certain rate or level (Oxford, 2006). In the context of development,

the World Bank's Robert Goodland breaks this larger concept down into four categories: human, social, economic, and environmental. Unfortunately, even a brief survey of the literature in a given field reveals that the term is often used indiscriminately and without specifying a particular focus, despite the obvious difficulties in comparing, for example, the ecological impact of an organization with the financial returns generated by another.[1]

The case studies in this paper describe two projects whose environmental footprint is inherently low, and, for reasons of both space and rigor, take a comparatively narrow focus on their overall impact. For these reasons, this paper considers primarily the ways in which organizations can cultivate social (also referred to as "institutional" or "organizational") and economic sustainability. This by no means suggests that this theoretical framework does not apply to the other dimensions of sustainability; further research may well be warranted on this topic.

Issue #2: Contradictory Recommendations for Achieving Sustainability

Even when practitioners focus on similar areas of sustainability, case studies in different areas of development offer recommendations for creating that sustainability that often stand in stark contrast to one another. For example, much of the literature on technology for development (ICT4D) emphasizes the need for a single project "champion" to engage stakeholders.[2] This recommendation is based on observed evidence from one or more projects (Pade-Khene, 2012); however, research on political will-building and public service delivery tells a different story. In Sumir Lal's discussion of his work on public sector reform in India, he describes how the progress of reform "made evident the futility of hinging the success of any reform program on a single champion" (Lal, 2008), an idea that is echoed in other literature on this topic (Odugbemi et al., 2008).

Another area of disagreement stems from an emphasis on impartial third-party facilitators and/or large-scale government donors. Many practitioners who have written on the subject of sustainability for ICT-based service delivery assume that such outside interventions are compatible with the definition of sustainability.[3] But Bennett (1998) asserts that social sustainability, at least, includes "long-term willingness" from all stakeholders, which government donors may be unwilling or unable to provide.[4]

These internal disagreements pose an obvious problem in terms of project analysis, particularly for initiatives that may fall into multiple categories. One possible explanation is the use of what are essentially "consensus statements" in one field, as opposed to the use of a macro-analytic framework; in the aforementioned Lal and Andrews pieces, for example, both authors draw on existing knowledge and theories of political risk, whereas the work by authors such as Marais is based heavily on case study evidence alone. Another is, to return to Problem #1, a lack of clarity regarding what the word "sustainability" actually means. The "champion" role described above by Marais is one that requires "time and effort," as well as "support, in many cases from sources outside the system" (Marais, 2011). A role that is so difficult that it inherently requires extra support, often from the outside, is not only unsustainable by most definitions; it also creates a project structure with a much more concentrated locus of potential failure.

Problem #3: Mechanisms vs. Theory

In Woolcock's "The Science of Delivery and the Art and Politics of Institutional Change," the author points out that within the science of delivery, the word *science* refers to both mechanisms and theory. He cites the illness scurvy as a classic example of this breakdown: for centuries, the mechanics of the cure (citrus fruit) was known, but not the theory (the vitamin C contained within) (Woolcock, 2014). While the knowledge of the mechanism is vital, it's often also limiting; without understanding what actually cures the disease, we are unable to search for treatments beyond those we already know.

Much of the literature on development sustainability is constrained by a similar focus. As noted above, many publications on this topic make their conclusions based on isolated case studies without further extrapolating any potential theoretical underpinnings, which can make replication challenging. And while the examples listed above focus on ICT4D, they are hardly alone in this approach: Hilderbrand and Grindle's work on public sector sustainability, to cite just one example, offers such recommendations as creating a "mission-focused mystique" (Hilderbrand and Grindle, 1997). Such responses answer the question of how to create public sector sustainability by offering *what* answers - they tell practitioners what to do - but stop short of offering a cause or rationale, a *why* or a *how*.

Because the science of delivery cuts across so many disciplines, however, it is precisely those answers that are needed. A simple mechanistic approach works within one sector, but - depending on the level of specificity - may not transfer easily to different contexts. An understanding of the larger principles that create success, however, ensures that such strategies have a much larger potential application.

Past Applications of Supply Theory to Sustainable Development

As noted above, to date, the only major publication to explicitly advocate usage of a supply framework to understand effective development projects is Unwin's 2005 work on sustainable technology development in Africa. In it, he advocates for partners to be considered in terms of both inputs and "benefits," or what might, in a traditional supply chain, be known as revenue. Most importantly, however, he advocates for a focus on demand from beneficiaries - the "customers" (emphasis mine) of this project.[5]

The analytical framework that follows builds on Unwin's pioneering work in this area. It expands upon this idea both in terms of the theoretical grounds to support the idea of a supply chain and in terms of the structure of the chain itself. Unwin focuses primarily on the existence of a supply linkage, rather than the form that linkage might take, and this paper aims to utilize further knowledge of these networks to increase the potential application of these theories.

THEORETICAL FRAMEWORK

With the exception of Unwin, the existing work on sustainable nonprofit service delivery is clearly limited. The same cannot be said of the research into sustainable product

and service delivery in the private sector, which is extensive and provides practitioners with a much larger "toolbox" regarding design and delivery.

This framework draws upon the private-sector literature to argue that public-sector and development-based service delivery can effectively be construed as a complex supply network. It rests on the following arguments:

1. That, based on Veblen's theory of intangible value conversion, such projects can accurately be analyzed using supply principles;
2. That supply chains themselves take the form of complex adaptive systems, and that upstream suppliers perform optimally when following the basic behavioral rules of such systems; and
3. That, *Q.E.D*, a public sector delivery project can also be understood as a complex supply chain, and its performance optimized accordingly.

Delivery Projects as Supply Chains

The major differentiator between private- and public-sector service and product delivery is the exchange of money. Unlike corporations, development initiatives often specifically target populations who are unable to pay, in the traditional sense, for goods and services. At first glance, this divergence suggests that the principles that apply to one sector may not be transferable to the other - an idea that would seem to be borne out by the limited number of comparisons that have been done in this area.

But Veblen's work on intangible value suggests that public sector projects of this nature can also be perceived as profit-focused entities. In *On The Nature of Capital,* he defines "intangible value" as quantities that "are immaterial items of wealth, immaterial facts owned, valued, and capitalized on an appraisement of the gain to be derived from their possession" (Veblen, 1908). As such, the entities that support such projects - governments, foundations, corporations - can be understood to receive an intangible return with the success of a given initiative, and that they can then quantify those returns and potentially convert them into tangible capital.

This idea is supported by the literature on corporate social responsibility theory, which posits that corporations may participate in activities that do not directly or immediately contribute to their bottom line as long as they yield some sort of beneficial return. As Garriga (2004) points out in her overview of CSR theories, there are a variety of incentives for companies to practice "socially responsible" behavior: they may see increased market share because of perceived innovation or improved reputation, increase the resources available to them in the long term by practicing more immediate restraint, establish themselves as an agent of power within a community through increased public presence, or leverage the networks and relationships gained through participation in such initiatives, to name just a few.

Considered from this perspective, public sector delivery is structurally indistinguishable from its private sector counterpart: just as with the manufacture of a salable good, a variety of suppliers contribute inputs, with the expectation that they will receive a return on their investment in some form. Despite the fact that the input may be financial or in-kind support instead of rubber or aluminum, and that the RoI may take the form of an

improved public reputation, as long as some kind of conversion strategy is in place, the two serve the same functional purpose.

Supply Chains as Complex Adaptive Systems

Regardless of its public or private status, a supply chain is a highly dynamic entity whose equilibrium varies based on suppliers, customers, and the external environment. Historically, such connections have been perceived as linear, quasi-static networks; however, this type of model is insufficient in that it fails to adequately illustrate the complex relationships and interdependencies between suppliers. In recent decades, practitioners have attempted to address these issues with frameworks such as the Six Sigma-based SIPOC, which illustrates supply chains in a non-linear fashion; however, even a tool like SIPOC fails to allow for secondary returns, such as the benefits of network participation. And perhaps more importantly, none of these models provide suppliers with tools for predicting risk and dealing with the inevitable variability caused by both internal changes and external environmental impact.

To address this issue, Choi et al. (2001) suggest that the most complete way to account for this variability is to understand such networks not only as nonlinear systems, but as *complex adaptive systems* (CAS) that adapt and reorder themselves in response to both internal and external stimuli. A CAS is a non-linear system that "emerges over time into a coherent form, and adapts and organizes itself without any singular entity deliberately managing or controlling it" (Holland, cited in Choi, 2001); in other words, it is a system comprised of agents who interact with each other according to their own interests, and who, in so doing, create a network with the capacity to evolve and change on both the micro and macro levels.

Based on the existing complexity literature,[6] Choi and his co-authors offer nine "underlying dynamics," or characteristics, that define a complex adaptive system, and offer counterparts within the field of supply theory for each. These dynamics, which fall into three categories - internal mechanisms, environment, and co-evolution - are then used as the basis for ten "propositions" that offer best practices for upstream suppliers seeking to optimize their returns. Each proposition is tested against the known behavior of for-profit supply chains and accepted theories of supply chain management, as well as real-life examples. Table 1 lists each of these propositions, along with a description of private-sector correspondence.

Table 1: Choi's Ten Propositions

Principle	Description	Private-Sector Analogue	Proposition
Internal Mechanisms			
Agents and Schema	Complex systems are populated by *agents,* or entities that can intervene meaningfully in the course of events. *Schema* refers to "norms, values, beliefs, and	The entities with the most capacity to intervene meaningfully in a business's supply chain are individual firms.	*Proposition 1: The greater the level of shared schema (e.g. shared work norms and procedures, shared*

	assumptions that are shared among the collective" (*Choi). At different levels of scale within the system, agents use individual values to interact with other agents that share those schema in order to create a level of optimal "fitness."	Areas in which firms might reasonably seek shared schema include quality, flexibility, and contract expectations; a unified vision for these concepts will lead to less time spent on conflict resolution.	*language) among allied firms in a SN, the higher will be [the] level of fitness for each of these firms (e.g. firm performance).*
Self-organization and emergence	Because CAS are comprised of multiple agents that interact with each other in different ways, smaller patterns and structures are naturally created by these individual interactions.	Component suppliers may subcontract part or all of their work to smaller firms. These new capital flows are not implemented by the manufacturer, but do affect their efficiency and performance.	*Proposition 2: Firms that adjust goals and infrastructure quickly, according to the changes in their customers, suppliers, and/or competitors, will survive longer in their SNs than firms that adhere to predetermined, static goals and infrastructure and are slow to change.*
Connectivity	Agents within a system are interconnected in a variety of ways - examples include communication, shared resources, and exchange of goods and services. At a certain point, the level of interconnectivity has the potential to impact the performance of the system overall, increasing or decreasing efficiency and optimization - what Choi et al. describe as the "critical level."	Within a supply chain, there is often a high degree of connectivity – between suppliers and immediate consumers, but also between upstream and secondary/tertiary suppliers, external institutions with potential market impact (such as a government agency), etc.	*Proposition 3: Within a SN, firms that are cognizant of activities across the supply chain (including the tertiary-level suppliers) will be more effective at managing materials flow and technological developments than firms that are cognizant of activities of only their immediate suppliers.*
Dimensionality	This refers to "the degrees of freedom that individual agents within the system have to enact behavior in a somewhat autonomous fashion" (Van de Ven, cited in Choi, 2001). A system has a higher degree of dimensionality if agents are free to act without the participation of others; outcomes will be less predictable, but also more likely to impact the system as a whole.	Supply chains can vary substantially in their levels of dimensionality. A vertically-integrated supply chain, for instance, allows for very little flexibility among suppliers; however, a manufacturer that relies on a diverse set of suppliers and controls them less tightly is part of a system with a much higher degree of dimensionality.	*Proposition 4: Successful implementation of control- oriented schemes (e.g. ERP, JIT II) leads to higher efficiencies, but it may also lead to negative consequences such as less than expected performance improvements and reduction in innovative activities by the suppliers.* *Proposition 5: The degree of innovation by suppliers is directly proportional to the amount of autonomy that suppliers receive in working with customers.*

Environment			
Dynamism	Dynamism refers to the fact that complex adaptive systems have the capacity to respond to changes ("adapt") in their environment. These responses may come in the form of the entrance of new agents, the exit of other participants, or an alteration of the boundaries or "shape" of the system itself.	Supply chains are dynamic in that they are often required to adapt to environmental changes in order to survive. New government regulations, for example, might necessitate the inclusion of a new supplier or the exit of an existing company.	Proposition 6: *Supply networks that turn over quickly stand a better chance of exposing weak members and, thus, gaining higher efficiency than supply networks that are artificially bound by long-term relationships.*
Rugged Landscape	"Ruggedness" refers to the relative number of interdependencies in a system. A system with limited interdependencies is described as "flat"; it is simple to optimize, but vulnerable to disruption. One with a higher level of interdependency is referred to as "rugged"; it is harder to optimize, but the risk is more distributed.	The ruggedness of a supply chain depends on the complexity of the product being made. A simple commodity, such as lumber, is likelier to have a "flatter" supply chain; something like a laptop computer, however, where there are a variety of parts that need to be compatible, is more likely to be rugged.	Proposition 7: *Modularization of tasks will decrease overall interdependencies among firms in a SN, and, thus, offer a higher efficiency when optimizing the overall system.*
Co-Evolution			
Quasi-Evolution and State Change	Complex adaptive systems tend towards a state Choi et al. describes as "quasi-equilibrium" - a balance between rigorous, unchanging order and complete chaos. During this period, the system will make incremental changes in order to stay in this balance, but will not change its overall form or function in any substantial way. However, the fluctuating environment can push systems away from this balance, ultimately requiring them to radically change their structure and behavior patterns in order to survive.	Suppliers can reasonably be expected to make small changes to increase efficiency – consolidating orders, for example. However, it usually takes an external impetus, such as a disruptive technology or product, to reshape an entire supply system, either by changing the needs of the consumer or making certain supply connections irrelevant.	Proposition 8: *Over time, quantum changes will last longer within a SN than incremental changes that go against the accepted practices.*
Non-linear change	The high degree of interconnectivity within a complex adaptive system means that a change or action undertaken by one agent may be felt far beyond its immediate neighbors. It may trigger a reaction among several other nodes in	While a tertiary supplier is not directly connected to consumers, their actions can impact others further down the supply chain – for example, by raising prices or creating delays.	Proposition 9: *Firms that deliberately manage their SN by both control and emergence will outperform firms that try to manage their SN by either control or emergence alone.*

	the network, and that reaction has the potential to inspire action from still others.		
Non-random future	The nature of complex adaptive systems makes it difficult to predict the outcome of any action with absolute certainty. However, the behavioral rules described above provide agents with the opportunity to influence the behavior of the system – in other words, to create a deliberate, not random, outcome. Greater diversification provides more of these opportunities for agents.	Firms can understand the behavior of the suppliers and consumers with whom they interact by viewing them as part of a complex system. As such, the firm can take actions that maximize the likelihood of a positive outcome. If their supplier base is diversified, there are more opportunities for firms to try and optimize their systems.	Proposition 10: *In a SN, upstream suppliers that are more diversified are more likely to survive than those that are not.*

Public-Sector Delivery Projects as Complex Supply Networks

If public-sector delivery projects can be understood as supply chains, and supply chains are best viewed as complex adaptive systems, does that then mean that the rules of complex systems can be used to optimize the sustainability of public sector delivery projects? Do these propositions also describe the behavior of successful upstream suppliers in the nonprofit world?

To answer this question, the next section of this paper focuses on two public-sector projects that have become economically and institutionally sustainable: the media-based education programs *Galli Galli Sim Sim*, in India, and *Takalani Sesame*, in South Africa. Both initiatives, run by the US-based nonprofit Sesame Workshop, bear the unique distinction of having "graduated" from USAID funding – that is, their work is entirely supported by a partnership of corporate donors, in-country public agencies, and partner nonprofits, all of whom have said they plan to continue support for the foreseeable future. The case studies that follow consider whether or not Choi's propositions can be accurately used to describe the projects in question and, if so, the implications for donor outreach and program design.

CASE STUDIES: GALLI GALLI SIM SIM AND TAKALANI SESAME

Background

Sesame Workshop is a US-based nonprofit whose mission is "to use the educational power of media to help all children reach their highest potential" (Sesame Workshop corporate site, 2014). In addition to its original television program, *Sesame Street,* the organization has developed local media programs and outreach activities in over twenty countries. But despite the demonstrated effect that these programs have shown on beneficiary educational outcomes (Cole, 2009), not all of these projects have lasted, particularly when support was limited to one or two major funders; the Palestinian program *Shara'a Simsim,* for example, received the bulk of its money from USAID, and was

forced to close immediately after the American Congress cut off all foreign aid to Palestine in 2012.

In this context, the long run of *Takalani Sesame* and *Galli Galli Sim Sim* is notable. Even more so is the fact that aside from their shared successes, the programs themselves operate in very different contexts. *Takalani Sesame* focuses heavily on issues of diversity and health, debuted in a relatively immature media market, and must contend with intensive media regulations. *Galli Galli Sim Sim,* in contrast, faces more substantial challenges in reaching rural children, launched in a well-established democracy with a substantial media market, and has fewer media regulations, but more intensive laws related to foreign investments. What both programs do share, however, is a similarly flexible approach to supplier management.

Case Study Methodology

The research for these case studies was qualitative in nature and came from a series of interviews conducted in Delhi, India; Johannesburg, South Africa; and Cape Town, South Africa, between January and April 2012. The interviewees for *Galli Galli Sim Sim* included two officials from Sesame Workshop India; representatives from Turner Broadcasting, *Galli Galli Sim Sim*'s corporate sponsor; an executive from Miditech, the former producer of *GGSS*; representatives from two India-based NGOs that collaborated with Sesame Workshop on outreach programming; a former executive with the Indian public media group Doordarshan; an officer from the Dell Foundation's India office; and an executive at Sesame Workshop's headquarters in New York. For the *Takalani Sesame* case study, interviews were conducted with a representative from Kwasukasukela, the media company that produces *Takalani Sesame*; producers with SABC 1, the public channel that broadcasts *Takalani Sesame;* a former project manager at SABC; an executive with the program's sponsor, Sanlam; and a representative from Sesame Workshop in New York.

Because these projects became successful prior to the start of this research, the analysis that follows takes an *ex post facto* approach, considering the relative accuracy of each proposition in describing the design and function of each model. A brief overview of each program and its findings is below; a more detailed breakdown can be found in Table 2.

Table 2: Choi's Ten Propositions Applied to Takalani Sesame and Galli Galli Sim Sim

Proposition	***Takalani Sesame* illustration**	***Galli Galli Sim Sim* illustration**
Internal mechanisms		
The greater the level of shared schema (e.g. shared work norms and procedures, shared language) among allied firms in a SN, the higher will be [the] level of fitness for each of these firms (e.g. firm	Post-apartheid timing of project launch contributed to both a willingness to work with new partners and a desire to cultivate shared values.	Shared work history and industry knowledge cited as a major success factor, particularly in bridging cultural divide between Indian and American implementing partners.

performance).		
Firms that adjust goals and infrastructure quickly, according to the changes in their customers, suppliers, and/or competitors, will survive longer in their SNs than firms that adhere to predetermined, static goals and infrastructure and are slow to change.	Program switched government agencies several times based on evolving understanding of its purpose and departmental capacity.	Public broadcaster Doordarshan was unable to successfully adjust its terms of negotiation with Sesame Workshop after regulatory changes and was forced to drop out of the partnership.
Within a SN, firms that are cognizant of activities across the supply chain (including the tertiary-level suppliers) will be more effective at managing materials flow and technological developments than firms that are cognizant of activities of only their immediate suppliers.	All participating partners displayed extensive knowledge of potential issues affecting other agents; strong knowledge of target audience was cited as a major factor in project success by all interviewees, even those without direct link to beneficiaries.	Sesame Workshop India's knowledge of outside factors affecting Turner/Miditech partnership allowed them to act quickly and proactively to reshape the partnership in response.
Successful implementation of control- oriented schemes (e.g. ERP, JIT II) leads to higher efficiencies, but it may also lead to negative consequences such as less than expected performance improvements and reduction in innovative activities by the suppliers.	Project did not grow until Sesame Workshop (USA) released rigid content controls and allowed South African partners the freedom to tailor the program to local context.	In order to maintain partnership, SWI focused on select mission-related controls, allowing implementing partners such as DigitalGreen and Turner to shape their inputs according to their individual needs.
The degree of innovation by suppliers is directly proportional to the amount of autonomy that suppliers receive in working with customers.	The development of Kwasuka Sukela's *Takalani Sesame* textbook project, an idea that originated within the company and not within Sesame Workshop, was a direct result of the autonomy Kwasuka Sukela had relative to the focal organization.	Implementing partner Gurgaon Ki Awaaz, a community radio station, was given leeway in materials presentation, and as a result has been able to broadcast program content in an idiom consistent with its particular listeners.
Supply networks that turn over quickly stand a better chance of exposing weak members and, thus, gaining higher efficiency than supply networks that are artificially bound by long-term relationships.	Partner contracts (5-10 years) were deliberately made shorter than project timeline (15 years) in order to enable adaptation; renegotiation in 2012 allowed all partners to make changes in terms of responsibilities and governance	Ability to shift enabled SWI to drop low RoI partners such as Doordarshan without significant programmatic disruption.
Modularization of tasks will decrease overall inter-dependencies among firms in a SN, and, thus, offer a higher efficiency when optimizing the overall system.	SABC's original plan to create outreach materials was transferred to corporate sponsor Sanlam after further interdependencies (such as Parliamentary funding) created inefficiencies for the government-run TV station.	Outsourcing of outreach to NGOs (DigitalGreen, Gurgaon ki Awaaz, etc.) not only diversifies reach, but allows for exit of individual suppliers without significant harm to overall system.
Over time, quantum changes will	While substitution of suppliers	Shift from public to private

last longer within a SN than incremental changes that go against the accepted practices.	has had a comparatively minor effect on programming, Sesame Workshop's introduction of an on-the-ground representative has led to both a new system structure and a stronger overall brand shift.	broadcaster has substantially reshaped the system to provide more influence to corporate sponsor Turner.
Firms that deliberately manage their SN by both control and emergence will outperform firms that try to manage their SN by either control or emergence alone.	Original broadcast of subtitled *Sesame Street* program, which exhibited strong controls from Sesame Workshop, failed after less than five years; shift to local partnership with some autonomy has created a program that has lasted for over a decade.	Initial input from SWI led to characters and storylines that were not well received with children. Allowing emergence facilitated the growth of a locally-relevant program with much stronger buy-in from target audience.
In a SN, upstream suppliers that are more diversified are more likely to survive than those that are not.	*Takalani Sesame* also exhibits strong diversification in both funding and in-kind support, which in turn has created an extensive network of partners with a stake in the show's survival.	SWI's diversified funding has allowed it to evolve while maintaining a presence on the ground. This contrasts strongly with SW (USA)'s Palestinian project, سمسم شارع *(Shara'a Simsim)*, which was forced to close immediately after losing its primary source of funding (USAID).

Takalani Sesame

Overview

Takalani Sesame, which means "Be Happy Sesame" in the tshiVenda language, began development in 1997 and premiered on the public broadcaster SABC in 2000.[7] Designed to address many of the societal issues that the country was facing, such as poverty and HIV, the show gained immediate popularity among a diverse audience and is now among the best-known brands in South Africa, with 91% of households reporting some awareness of the program (SABC Education, 2013).

The program, an initiative of Sesame Workshop, was originally funded in part with a grant from USAID, as well as financial and in-kind support from private donors. In the decade-plus since its debut, however, Sesame Workshop has developed a coalition of public and private institutional stakeholders, each of whom receives a discrete return on their participation that matches or exceeds their initial investment. What this means, in effect, is that the program is able to function on its own, without requiring - or receiving - American governmental assistance.

Stakeholder structure

There are many stakeholders whose presence is crucial to *Takalani Sesame'*s success, all of whom receive some form of return on their investment or participation. The major partners are:

- **Sesame Workshop (USA),** nonprofit **(focal supplier)**

- Contribution*:* Large-scale project management, branding, and media capacity.
- Interests and incentives*:* The organization's goal is as follows:

Promoting literacy, numeracy and basic life skills, the project endeavors to incorporate all of South Africa's 11 national languages (Afrikaans, English, isiNdebele, isiXhosa,isiZulu, Sesotho saLeboa, Sesotho, Setswana, siSwati, Tshivenda and Xitsonga). Additionally, Takalani Sesame has historically maintained a special focus on HIV/AIDS education by introducing age-appropriate messages designed to counter stigma and break the culture [of] silence around the disease (Sesame Workshop, 2010).

Sesame Workshop has also begun programming in neighboring countries, and its South Africa project is, to a certain extent, a resource for its other projects in the region.[8]

- **Sanlam,** insurance company
  - Contribution: Funding, management of selected outreach programming
  - Interests and incentives*:* Until the end of apartheid, Sanlam was a company that was largely focused on the Afrikaner population.[9] By sponsoring a popular television program, the company is able to increase its brand awareness among the growing (and increasingly diverse) middle class. Sanlam also tracks its reputation and the effect that has on customer engagement and retention, and - on an informal level - has been able to promote itself to the South African government as a socially responsible company (Sanlam executive interview, 2012).

- **SABC,** public television network
  - Contribution: Management of program's television component, production capacity, airtime, selected outreach
  - Interests and incentives: As a mission-driven organization with a specific government mandate to provide children's television programming, participation in *Takalani Sesame* contributes to the achievement of that mission and, in turn, a favorable example to present to Parliament.[10] However, the show also remains a huge source of ratings for the network, and as the country's media market begins to expand to include satellite as well as terrestrial broadcasting, SABC has a specific interest as well in maintaining its audience share.[11]

- **Kwasuka Sukela,** production company
  - Contribution: Television production, *Takalani Sesame*-branded textbooks
  - Interests and incentives: As a contractor hired by Sesame Workshop, Kwasuka Sukela's interests in the program are largely fiduciary. However, it has a substantial incentive to produce a quality program, as it operates under a contract that can be renewed or dropped; it has also benefited from

the in-house expertise of Sesame Workshop in terms of the production of children's programming, which was a relatively nascent idea in the country when *Takalani Sesame* was introduced.[12] Furthermore, the fact that *Takalani Sesame* is a widely known brand in South Africa means that the company's reputation as a television producer is also at stake. Finally, its experience with educational programming through *Takalani Sesame* gave it the capacity and connections to begin production of the textbook line.

- **Ministry of Basic Education,** government agency
  - Contribution: curricular and outreach support, research
  - Interests and incentives: Given that educational outcomes remain poor among many segments of the South African population, the MoBE has a substantial interest in the program's distribution and efficacy, as it has the potential to improve educational outcomes among South African students and ultimately reduce the costs needed to address these issues.

- **Target audience,** children 3-6 years old and their caregivers
  - Contribution: mission fulfillment, reputational capital, customer base for program partners
  - Interests and incentives: South African children, unsurprisingly, have an interest in watching shows that entertain them and to which they can relate. Their caregivers, in turn, seek similar qualities for the shows their children watch, but have also demonstrated a desire to have access to programming that improves their child's potential educational trajectory. The show has proven popular among children and adults; as one parent said, "Even I know the songs on the show" (parent interview, 2012).

Takalani Sesame as complex adaptive system

Takalani Sesame's network of donors and supporters, like the supply networks Choi describes, features clear internal mechanisms, a relationship to its external environment, and the capacity for co-evolution and state change. These characteristics are described in the subsections below. More details for each proposition can be found in Table 2.

Internal mechanisms

The existence of shared schema (work norms, language, etc.) has played a clear role in allowing *Takalani Sesame* to succeed in uniting otherwise very different partners behind a joint goal. The project's post-apartheid launch, in an atmosphere frequently described as "hopeful" (SABC executive, 2012; Ministry of Education executive, 2012), was cited by multiple participants as a key factor in facilitating work between organizations such as SABC, an agency of the newly united government, with Sanlam, an insurance company whose customer base was historically Afrikaner.

Each participating organization also closely monitors activities across the supply network in an effort to predict risk, and has shown a willingness to modify participation

accordingly. Representatives from both Kwasuka Sukela and Sanlam, for example, referenced the funding-related conflicts between SABC and the larger South African parliament, and cited the future results of those issues as a factor that would significantly influence their participation in coming years.

Environment

The ability to adapt was, in a sense, built into the *Takalani Sesame* supply network. While Sesame Workshop designed the project with a 15-year timeline, contracts for each partner were purposely kept between five and ten years in order to allow for adaptation and the exit or entrance of new partners. In interviews, sources from every single partner not only cited this as a key factor in the project's success, but also noted that the 2012 contract renegotiations would provide them with the opportunity to reorganize the governance structure based on current project inefficiencies.

The *Takalani Sesame* network also, however, showed *de facto* as well as *de jure* tendencies towards adaptation. One example of this was the creation of outreach materials, which was originally assigned to SABC. After Parliamentary funding constraints prevented them from doing so in a timely or efficient matter, however, Sanlam took over, strengthening not only the project's overall reach but its own direct connection to the project's consumers (Sanlam executive, 2012).

Co-evolution

Sesame Workshop began the project by imposing significant controls on the project, and failed consistently in doing so. Initial attempts involved a dubbed version of the American program, which played poorly among South African children; when *Takalani Sesame* itself was developed, the organization attempted to transpose some of its existing characters, but was forced to adapt them in response to audience feedback. (A planned Grouch figure, for example, was scrapped.) Certain controls - on the project's mission, for example - have remained, but in other ways the program has evolved according to the needs of its audience, and emergent structures within the supply chain have developed accordingly.

Takalani Sesame also exhibits substantial diversity in its supplier base, which has prevented the project from being derailed by the failure of one or two contributors. Because it receives funding from Sanlam as well as the Ministry of Education, it has been able to continue even when political issues slowed the flow of government money.

Galli Galli Sim Sim

Overview

In many ways, *Takalani Sesame* laid the groundwork for *Galli Galli Sim Sim*'s success. In 2006, Sesame Workshop decided to test the potential for an edition of the show - either Anglicized or custom - in the Indian media market. Initial seed funding came from USAID and the bank ICICI. Like its South African counterpart, however, it has since ceased to rely on American federal aid, receiving instead both financial and in-

kind support from a coalition that includes Turner Media, the Dell Foundation, and a variety of local NGOs.

The main product of the project is the television show *Galli Galli Sim Sim,* which translates roughly from Hindi as "Everywhere is Sesame Street." The show is set in a mixed urban/rural setting and stars a variety of characters closely tied to various aspects of Indian culture, including Boombah, a lion (vegetarian, like many Indians) who loves *bhangra* music and believes himself to be descended from the ancient Mughal emperors; Kewal Khadoosa, a grumpy old man modeled after a traditional village archetype; and its star, Chamki, an inquisitive girl whose name translates as "Sparkle."

Stakeholder structure

Like *Takalani Sesame, Galli Galli Sim Sim* receives financial support from multiple sources. Unlike that program, however, it also works closely with several NGOs who incorporate *GGSS'*s materials into their work. While such organizations do not contribute funding, they do further the project's overall mission, which in turn provides the funders with demonstrated impact.

- **Sesame Workshop (USA)/Sesame Workshop India,** nonprofit **(focal suppliers)**
  - Contribution*:* Large-scale project management, branding, media capacity, local knowledge (SWI). Sesame Workshop (USA) provides funding and overall direction; the local management is done by Sesame Workshop India, which has a substantial staff and is better able to implement projects on the ground. As in South Africa, Sesame Workshop has also begun to use *GGSS* as a resource for other projects it has created in the region, such as the Bangladeshi program *Sisimpur* (SWI executive, 2012).
  - Interests and incentives*:* The organization's goal is as follows: *Our projects bring critical skills in literacy and numeracy, emotional health and well-being, health and hygiene, and inclusion to children throughout India.*

- **Turner,** media conglomerate
  - Contribution*:* Funding, airtime, promotion, production (starting 2012)
  - Interests and incentives*:* Broadcasting *Galli Galli Sim Sim* allows Turner to grow its audience share among the early childhood demographic, as well as improving its reputation within the general population (Turner executive, 2012). The collaboration also provides the network with the opportunity to learn from Sesame Workshop, which has a much longer history with educational television (Turner executive, 2012).

- **Michael and Susan Dell Foundation,** charitable foundation
  - Contribution*:* Capital, management and organizational consulting services
  - Interests and incentives*:* Contributing to programs such as *Galli Galli Sim Sim,* which are both popular and effective, allows the Dell Foundation to

fulfill its mission. This, in turn, gives concrete results that they can use to attract potential donors.

- **Other foundations,** such as the MetLife Foundation
  - Contribution*:* Capital
  - Interests and incentives*:* Like the Dell Foundation, other charitable contributors share parts of their mission with *Galli Galli Sim Sim.* Working with a known quantity like Sesame Workshop minimizes their risk, and the results generated allow them to offer proof to potential future donors.

- **Miditech,** production company
  - Contribution*:* Television production (until 2012)
  - Interests and incentives*:* Miditech, like Kwasuka Sukela, was a contractor. But it had a reputation before its participation as a source of high-quality educational programming, and therefore had a vested interest in ensuring that the program achieved its mission (Miditech executive, 2012). This is especially true in the Indian production market, which is highly competitive (one interviewee described it as "cutthroat") (SWI executive, 2012).

- **Various NGOs,** implementing partners. At the time of this research, the two groups most closely involved with *GGSS* were the community radio station Gurgaon ki Awaaz and the agricultural outreach group DigitalGreen.
  - Contribution*:* local knowledge, implementation capacity
  - Interests and incentives*:* Implementing *Galli Galli Sim Sim* themed programming is, in the case of both organizations mentioned here, concordant with their larger mission. They also have the opportunity to provide services that use a popular and well-established brand, and, through their work with Sesame Workshop, build their reputations within the nonprofit community (DigitalGreen executive, 2012).

- **Target audience,** children 3-6 years old and their caregivers
  - Contribution*:* audience share, brand awareness, mission fulfillment
  - Interests and incentives*:* Like South African children, Indian children are interested in watching shows they find relevant and entertaining. Their caregivers, meanwhile, place a strong priority on those shows being educational.

Internal mechanisms

Every interviewee for this case study noted shared work norms as a major reason the project was able to quickly get off the ground. Several of the organizations had worked together before, which gave them a strong common knowledge base. Even where agents had not previously collaborated, there was some sense of mutual understanding; Sash-

wati Banerjee, head of Sesame Workshop India, cited her background in corporate consulting as a significant asset in dealing with a multimillion-dollar company like Turner India.

The upstream supplier, Sesame Workshop, also showed a clear ability to adapt to internal changes in order to continue the project, as evidenced by their switch from public broadcaster Doordarshan to Turner India. Doordarshan, in contrast, was not able to adapt its contract with Sesame Workshop after government regulators changed its fee structure, which led to its being forced out of the partnership.

Environment

All of the partners who worked on *GGSS* demonstrated a clear knowledge of activities across the supply network, both in their overall performance and individually during our interviews, and adapted their actions accordingly. The clearest example of this is the switch from Miditech to Turner as a production partner. Due to an unrelated conflict between the two companies, Turner threatened to pull out entirely if Miditech remained with the project (SWI executive, 2012; Turner executive, 2012). Sesame Workshop India, which had been monitoring the conflict, was prepared for this situation, and arranged for Miditech to quietly exit the partnership.

GGSS has also allowed its partners, particularly its nonprofit implementers, significant autonomy in their work as long as it contributes to the program's overall mission, and the result has been innovative approaches to dissemination. For example, community radio station Gurgaon ki Awaaz was permitted to use its own actress to voice main character Chamki, and as a result has been able to deliver a broadcast program in the dialect and idiom familiar to its particular listeners (Gurgaon ki Awaaz executive, 2012).

Co-evolution

One of the most notable things about Sesame Workshop India is how explicit they have been in the need to balance control and emergence in order to survive and evolve. There have been several instances in which either the mission or the partnership itself has faced substantial threat; for example, Turner made part of its participation contingent on allowing commercial "bumpers" for the television show, a practice that Sesame Workshop has generally not allowed (SWI executive, 2012). In order to maintain both its mission and the survival of its program, Sesame Workshop established a set of non-negotiables around which Turner was allowed to work - for instance, commercials could not violate the program's overall mission. (One notable example of this was the program's refusal to air commercials for "Fair and Lovely," a skin-lightening cream, given India's history of discrimination based on skin color.)

The diversification of Sesame Workshop's supplier base has also allowed it to survive without being entirely beholden to the whims of a large corporation such as Turner. While much of its funding and production does come from them, they also receive support from other foundations and have used nonprofit partners to implement their work. In the event that Turner chose to exit the supply chain, it is conceivable that the program

could carry on in some form, either on a different channel or through the programs of groups like Gurgaon ki Awaaz.

IMPLICATIONS FOR THE SCIENCE OF DELIVERY

In a sense, the ideas presented in this paper are nothing new. Each of the recommendations presented by Choi has been offered in some form or another in the development literature of the past thirty years; as early as 1982, Rondinelli's article "The Dilemma of Development Administration: Complexity and Uncertainty in Control-Oriented Bureaucracies" introduced the idea of development as a complex system, and countless newer publications have emphasized the need to be sensitive to a project's context and agile and flexible in their response.

But Choi's framework has several key components that enable its use among practitioners who seek better and more efficient methods of delivery. Most obviously, it unites these best practices into a single tool that can be used to plan and implement projects that have a higher likelihood of achieving long-term sustainability. And because its application is cross-disciplinary, acceptance of these ideas opens up the possibility of using the previously untapped private-sector supply literature to improve public sector service delivery, in effect arming practitioners with new strategies and ideas that they can use as they seek to implement these ideas in different areas.

One of the most important implications for this framework, however, is that the people who have previously been described as "beneficiaries" are given true stakeholder agency, referred to as people whose needs and desires truly matter for the success of a project. Within the private sector, the consumer is the most important factor in a supply chain; if they are not satisfied, they will not purchase a good or service, and the entire supply chain is moot. By transferring the supply framework to the public sector, we can better understand the ways in which target audience satisfaction contributes to the "returns on investment" expected by donors, and, just as in the business world, their ultimate satisfaction becomes the main criteria for a project's success.

Next steps and research agenda

In order to strengthen our understanding of the potential applications of this theoretical framework to public sector delivery projects, further test cases from a variety of fields are required. If these principles do prove accurate, however, it should be possible to both improve the prospects for sustainable design and fine-tune these principles' implementation with more study into specific aspects of CAS theory. Since this application is rooted in supply chain theory, it makes sense to consider how these have been studied over the last decade in that field. Some of the issues that have been addressed in that context, and which might be relevant for development practitioners, are as follows:

Risk

Risk sharing in both procurement and production is a major concern for supply chain managers; given the low resources and high volatility faced by most development pro-

jects, it ought to be a high priority issue there too. One possible approach is the one taken by Allen et al. (2012), who break down specific vulnerable locations in a German paper tissue company by analyzing its supply chain as a CAS. Another is that taken by Vachon and Klassen (2002), who consider how different levels of complexity affect risks specific to delivery performance. In the context of development, such a topic could consider how different partnership structures exacerbate or mitigate the risks that a given intervention won't reach its target population.

Innovation and knowledge flow

The supply chain literature suggests that some network structures are more likely than others to foster innovation, both through increased autonomy and through knowledge sharing and information flow. Ethiraj and Levinthal (2004), for example, analyze "what constitutes appropriate modularization" - in other words, how modular a system should be in order to be as efficient and adaptive as possible. Another potential area of study comes from Sorenson et al. (2006), who look at the way specific types of information flow differently across complex supply systems. In order to understand how innovation can be used to create the most effective and context-specific interventions, we need further information on how innovation occurs within different project and system structures, and how that varies based on the projects themselves.

Negotiation and transaction costs

Simply knowing that relationships exist between parties does not offer any way to maximize the effectiveness of those relationships. Jain and Deshmukh (2009) apply the principles of game theory to look at how relationship "fitness" and satisfaction can be improved in different areas of a CAS-based supply chain, and Choi, in a 2006 follow-up to his original work, seeks to understand how different types of negotiations can affect transaction costs across a system. For nonprofit program managers, partners who fit a certain set of criteria (corporations with a particular structure, for example) may have similar schema, and different negotiation tactics might thus be more effective.

CONCLUSIONS

Sustainability is not only a vital component of the science of delivery; it is also a goal that is potentially achievable across a variety of sectors. The success of the coalitions that support Sesame Workshop's work, and the structural factors that influence that success, suggest that delivery can and should be analyzed for optimization, and that this analysis can enable practitioners to create programs that are not only engaged with their target audience, but are also agile and flexible when faced with internal and external challenges. As with any provider of goods or services, development practitioners that are comfortable with control and emergence have the potential to last much longer than those that rely on one or the other alone.

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NOTES

[1] For a more detailed analysis of this issue, see Ali and Bailur (2007).

[2] Frequently-cited examples of this include Hosman and Fife (2007) and Marais (2011).

[3] See, for example, Pade-Khene (2012) and Hosman and Fife (2007).

[4] One example of this can be seen in the creation of the Millennium Challenge Corporation, a US aid agency designed explicitly for short-term assistance.

[5] For more on the theoretical justification for analyzing nonprofits through an operations framework, see Privett, N., and F. Erhun. "Efficient Funding: Auditing in the Nonprofit Sector." Manufacturing & Service Operations Management 13, no. 4 (September 2, 2011): 471-488, which assesses the extent to which the donor-nonprofit relationship can be considered a version of the principal-agent problem.

[6] The research that forms the basis of Choi's framework includes Argyris and Schon (1978), Kauffman (1995), and Schein (1997).

[7] Human Sciences Research Council. "Assessing the Impact of HIV and AIDS Prevention and Care Programmes in South Africa". Pretoria, n.d.

[8] Sesame Workshop executive, personal communication, March 2012.

[9] Sanlam. "Economic Empowerment." Sanlam.co.za, 2011. http://www.sanlam.co.za/wps/wcm/connect/sanlam_en/Sanlam/About Sanlam/Our Heritage/Economic Empowerment/default content?presentationtemplate=Shared/PT-Print.

[10] SABC executive, personal communication, January 2012.

[11] Ibid.

[12] SABC executive, personal communication, January 2012.

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